Tripod Project as a Process

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The National Nuclear Security Agency (NNSA) Advanced Simulation and Computing (ASC) program chartered the Tripod project, initially targeted at Linux capacity computing clusters, to develop a seamless software environment for use by the NNSA tri-lab community (Los Alamos, Livermore, and Sandia national laboratories). Los Alamos has made suggestions for viewing Tripod as an ongoing process, which were well received at the December 13, 2006, Tripod tri-Lab meeting at Livermore.

The rapid pace of change in the computer industry is legendary. To deal with this rapid change, Tripod needs to define an agile process. While the details have yet to be defined, the essential requirements for this process include the following:

1) Ongoing discussions and quarterly technology direction evaluation: Tripod should prepare a roadmap for high-performance computing (HPC) capacity systems based on market trends, re-evaluate this document quarterly, and update it as needed. This roadmap should propose a small number of strategies for top trends and encourage market competition within the chosen software interfaces. To evaluate these strategies under full production conditions, in time to guide decisions, "pathfinders" are needed. Once a path has been chosen, Tripod should educate the user community early about the necessary changes.

2) New capacity systems should follow an accelerated procurement and deployment schedule to maximize their productivity. A rapid applications readiness process to stabilize new systems for production must not require a tri-Lab agreement on minor technical details. Each lab will have to comply with its local security requirements. Software choices should follow the Tripod roadmap in broad terms. The focus ought to be on standard interfaces, with equivalent functionality seen as acceptable. The Tripod roadmap should be reviewed and updated based on recent deployment experience so that the next deployment is made faster.

3) Old capacity systems in full production should be updated when justified, but those updates must be carefully managed to minimize disruption to users. It is essential that updates be governed by a cost/benefit analysis.

Los Alamos recommendations for Tripod policies are as follows:

1) New capacity systems should be consistent with the Tripod roadmap, with criteria divided into three tiers: (a) equivalent functionality based on public standards for software interfaces, (b) software robustness (consider dependencies and avoid single points of failure), and (c) specific Tripod software components used. For non-ASC users, other software stacks may be appropriate.

2) Upgrades of old capacity systems in stable production, which were Tripod compliant, should be governed by a

cost/benefit analysis when Tripod software recommendations change.

3) Some capacity systems in full production should be used as "pathfinders" to evaluate benefits of alternative software stacks. Rapid evolution of HPC technology is expected to create radically different architectures within 5 to 10 years, including radical changes in Tripod software stack, yet we cannot get there without effort. Staying at the forefront of computing is critical to national security.

Conclusion

Tripod should define a process that tracks the forefront of computing with agility, speed, and precision, and yet delivers reasonable stability to users. Our goals are user productivity at justifiable cost/benefit ratios and management of lifecycle costs. Therefore, Tripod should foster R&D in areas expected to improve productivity. We can use bidirectional leverage to reduce procurement and support costs: leveraging the mass market and contributing software as open source to a larger community of users to leverage their support. Tripod must also consider software component dependencies and reduce the impact of bugs.

Tripod policies should respect local security requirements, deliver a consistent tri-Lab user experience, yet allow for different types of capacity systems in production ("pathfinders"). Upgrades of old systems should be guided by cost/benefit-based decisions. Finally, robustness of the Tripod software stack requires avoidance of single points of failure wherever possible.

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